

Application No. 10/019,275
Amendment dated March 18, 2004
Reply Office Action of January 9, 2004

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

Claim 1 (canceled)

Claim 2 (canceled)

Claim 3 (currently amended): ~~A diode-structure diamond ultraviolet light-emitting device according to claim 1~~ A diode-structure diamond ultraviolet light-emitting device, said device comprising a p-type semiconductor layer formed of diamond crystal, and an n-type semiconductor layer formed of diamond crystal, said device emitting light when excited by current injection, wherein the free exciton recombination radiation is dominant, and wherein said the free exciton recombination radiation being dominant refers to a state where the intensity of the free exciton recombination radiation is at least two times or more greater than the intensity of radiation caused by impurities or defects, wherein said diode-structure diamond ultraviolet light-emitting device comprises a pn junction.

Claim 4 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein both said diamond crystals are high-quality crystals including only a minute amount of impurity other than the dopant.

Claim 5 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein said n-type diamond crystal is a diamond crystal doped with phosphorous.

Claim 6 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein said n-type diamond crystal is a diamond crystal doped with sulfur.

Claim 7 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein said n-type diamond crystal is a diamond crystal grown by the chemical vapor deposition method.

Claim 8 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein said p-type semiconductor diamond crystal is a diamond crystal doped with boron.

Claim 9 (original): A diode-structure diamond ultraviolet light-emitting device according to claim 8, wherein said boron-doped diamond crystal has a boron concentration of 100 ppm or smaller.

Claim 10 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein said p-type semiconductor diamond crystal is a crystal synthesized by the high temperature and high pressure synthesis method.

Claim 11 (original): A diode-structure diamond ultraviolet light-emitting device according to claim 10, wherein said high-temperature and high-pressure synthetic diamond crystal is synthesized by adding a nitrogen remover to the flux.

Claim 12 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein said p-type semiconductor diamond crystal is a diamond crystal grown by the chemical vapor deposition method.

Claim 13 (previously presented): A diode-structure diamond ultraviolet light-emitting device according to claim 7, wherein said diamond crystal grown by the chemical vapor deposition method is a homoepitaxial film grown homoepitaxially on a diamond crystal substrate.

Claim 14 (previously presented): A diode-structure diamond ultraviolet light-emitting device according to claim 7, wherein said diamond crystal grown by chemical vapor deposition method is a diamond crystal film grown by the microwave plasma-assisted chemical vapor deposition method.

Claim 15 (currently amended): ~~A diode-structure diamond ultraviolet light-emitting device according to claim 1~~ A diode-structure diamond ultraviolet light-emitting device, said device comprising a p-type semiconductor layer formed of diamond crystal, and an n-type semiconductor layer formed of diamond crystal, said device emitting light when excited by current injection, wherein the free exciton recombination radiation is dominant, wherein said the free exciton recombination radiation being dominant refers to a state where the intensity of the free exciton recombination radiation is at least two times or more greater than the intensity of radiation caused by impurities or defects, wherein , said device comprising a said p-type semiconductor layer is diamond crystal synthesized by means of a [[the]] high temperature and high pressure synthesis method, and wherein said [[a]] n-type diamond crystal is grown on said p-type semiconductor layer diamond crystal by means of a [[the]] chemical vapor deposition method.

Claim 16 (currently amended): A diode-structure diamond ultraviolet light-emitting device according to claim 3 [[1]], wherein a first diamond crystal grown by the chemical vapor

deposition method is formed on a diamond substrate, and a second diamond crystal grown by the chemical vapor deposition method is further formed thereon.

Claim 17 (original): A diode-structure diamond ultraviolet light-emitting device according to claim 16, wherein said first diamond crystal grown by the chemical vapor deposition method is either a p-type semiconductor diamond crystal or an n-type semiconductor diamond crystal, and said second diamond crystal grown by the chemical vapor deposition method is either an n-type semiconductor diamond crystal or a p-type semiconductor diamond crystal that differs from the first diamond crystal grown by the chemical vapor deposition method.

Claim 18 (previously presented): A diode-structure diamond ultraviolet light-emitting device according to claim 16, wherein said second diamond layer grown by the chemical vapor deposition method is grown selectively on said first diamond layer grown by the chemical vapor deposition method.

Claim 19 (previously presented): A diode-structure diamond ultraviolet light-emitting device according to claim 16, wherein an electrode is formed on the exposed surface of said first diamond layer grown by the chemical vapor deposition method.

Claim 20 (new): A diode-structure diamond ultraviolet light-emitting device, comprising:

a p-type semiconductor layer formed of a diamond crystal; and
an n-type semiconductor layer formed of a diamond crystal,
wherein said device emits a light when excited by current injection, wherein the light has
an acute spectrum peak of a free exciton recombination emission, wherein the acute spectrum peak
has a ridge having a steep inclination.

Claim 21 (new): A diode-structure diamond ultraviolet light-emitting device according to
claim 20, wherein a range occupied by the ridge including the acute spectrum peak is less than
300nm.

Claim 22 (new): A diode-structure diamond ultraviolet light-emitting device according to
claim 20, wherein the acute spectrum peak appears in the vicinity of 235nm, 242nm, 249nm or
257nm.